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#### ABSTRACT

A method for manufacturing a microstructure, which includes at least one fine feature on an existing feature, using an NSOM laser micromachining system. A microstructure device preform is provided. A portion of its top surface is profiled with the 5 NSOM to produce a topographical image. This profiled portion is selected to include the existing feature. An image coordinate system is defined for the profiled portion of top surface based on the topographical image. Coordinates of a reference point and the orientation of the existing feature in the image coordinate system are determined using the topographical image. The probe tip of the NSOM is aligned over a portion of the 10 existing feature using the determined coordinates of the reference point and the orientation of the existing feature. The top surface of the microstructure device preform is machined with the micro-machining laser to form the fine feature(s) on the existing feature.